THE JOURNAL OF GEOGRAPHY

VOL. VIII. DECEMBER, 1909 NO. 4

NORTH AMERICA AND EUROPE: A GEOGRAPHICAL COMPARISON[1]

By PROFESSOR ALBRECHT PENCK
of Berlin University

NOTHING could surpass my curiosity when I landed for the first time in North America, a new world, separated from the old one by a great ocean. As a geologist, I knew that similar rocks formed the land and that similar surface features would occur; but as a geographer, I knew too that the vegetation of North America differs from that of Europe and that there are only a few species common to both sides of the water. What will be the impression of the landscape—will it be European or a different type? But when I put foot on the land near Quebec I became aware that the general features of the landscape and the surroundings of man were nearly the same there as in Europe, and only a closer inspection convinced me that I was amid a new flora. Indeed, I had the feeling of being, not in a latitude south of Vienna, from whence I had just come, but rather of being in the same surroundings as at Stockholm—twelve degrees of latitude further north.

There are, indeed, very strong similarities between North America and Europe. A superficial glance at our maps will reveal similar features. Europe is only a peninsula of Asia, and the peninsular character determines all features of this continent. North America may be compared with the whole of Eurasia, and its eastern part shows a peninsular articulation similar to Europe. That peninsular region stretches east of the Mississippi Valley, the region of the Great Lakes and Hudson Bay, and there are doubtless more pronounced geographical differences between this articulated part and the continental part of North America than between peninsular North America and peninsular Eurasia—that is, Europe.

Europe gets its characteristic features from certain invasions of the sea.

[1] A lecture delivered at Columbia University, on November 3, 1908.

Northeast of Scandinavia a part of the Arctic Sea penetrates into the land and branches here as the White Sea. Further south the very edge of the continent seems to be inundated, so that Great Britain and Ireland are isolated, and from the German Ocean the Baltic Sea extends far into the interior of the continent. Still further south is the Mediterranean Sea, which separates Europe from Africa. All these features seem to be repeated on the west side of the Atlantic. Here we see the Arctic water penetrating far to the south, forming Hudson's Bay. Farther south the eastern corner of North America is inundated; Newfoundland is isolated, like Great Britain; and the Gulf of St. Lawrence extends far into the interior of the country, getting its waters from that remarkable group of lakes which in many respects resemble the Baltic Sea. This resemblance was far stronger at the end of the last geological epoch, when a vast body of fresh water existed instead of the Baltic Sea, which poured through the river valley of the Sound between Denmark and Sweden into the basin of the German Ocean. The resemblance of the Gulf of Mexico to the Mediterranean is such a striking one that Alexander von Humboldt called it a mediterranean sea; and, indeed, it divides America into two separate continents—North America and South America.

These similarities between Europe and Peninsular North America are not merely superficial ones. In a very remarkable way, these two sides of the Atlantic repeat the same structural features; there is an astonishing symmetry, as Eduard Suess has shown so clearly. The northeast of Canada and Labrador on one side, and Scandinavia with Finland, the region of Feno-Scandia, on the other, are both composed of the oldest rocks we know. These have a very complicated structure, being intruded with many eruptive rocks, and, in a secondary way only, the surface features of the above regions are dependent on their structure. Both regions had already been leveled down before Cambrian times, and they sink gently down under a cover of horizontal Palæozoic strata. Both were called by Suess *Shields*. The resemblance between these Shields is the more conspicuous because both were covered during the last ice age by a glaciation which molded their surface in a similar way. In Sweden and Finland we find the same rounded glaciated surface, the same numerous lakes, as in Canada, both regions of the earth claiming to be the land of many thousand lakes. At the border of both regions the horizontal Palaeozoic strata begin with an escarpment which is pronouncedly south of Lake Erie and south of the Gulf of Finland, called here the "glint," and we shall keep this expression to designate similar escarpments. These strata con-

tinue far into the interior of Eurasia, and they do the same in North America.

In the same way that we compare the Canadian Shield with the Scandinavian Shield, we can compare the region east of the Mississippi Valley with the interior of Russia—both parts of the world have never been compressed by mountain-folding since Palaeozoic time. Only a few faults occur here, and the whole geological history consists in slight up-and-down warps which brought both regions several times under the surface of the transgressing ocean. Here also the more recent geological history has augmented the similarity. Huge morainic accumulations south of the Great Lake region of North America form the watershed between the Mississippi and St. Lawrence Rivers, and similar morainic deposits form the watershed between the Baltic and the Black Seas. Thick loess deposits are found in front of these morainic deposits in the Mississippi basin as well as in the interior of Russia. The loess gives rich harvests to the corn regions of Iowa, Nebraska, Kansas, Missouri and Illinois, the counterparts of which are found in Volhynia and the region of the Chernoziom (Black Earth) of the south central governments of Russia.

East of the Mississippi basin the old Palaeozoic strata are folded and form the Appalachian belt, and similarly, west of the plains of Russia the Palaeozoic strata of Europe are folded, forming a set of mountains which we can trace from the south of Russia to the west coast of Europe. In the central part of Germany these mountains constitute the belt of the German upland, and here it was that their geological history was first understood. The folding of the strata occurred near the end of the Palaeozoic era and ceased before the end of the Permian epoch. Then they were base-leveled and covered totally or in part by Mesozoic deposits, after which mountains arose by faulting and warping, forming here and there true tilted blocks. The elevated parts lost their Mesozoic covering and the old folded strata again became visible.

This history is nearly the same as that of the Appalachian region. Here also the folding of the strata ended towards the close of the Palæozoic era and the folded mountains were leveled down. Then they became partly or totally covered with Mesozoic deposits, and the mountains of to-day were formed by upheaval. In North America, indeed, they form a more connected zone, while in Europe they are mostly groups of mountains, separated from each other by basins of Mesozoic or younger strata. During the epoch of folding, the Appalachian region and the zone of the Hercynian Mountains of Europe may have formed mountains of the height

of the Alps. I have called them, therefore, the Palaeozoic Alps of middle Germany. But to-day these regions have only lower altitudes; they do not surpass 2,000 meters as the Appalachian region does. The striking features of these base-leveled Palaeozoic mountains consist in the fact that on both sides of the Atlantic the belt of their ancient foot-hills contains coal measures. Like the Allegheny region in North America, so the mountains of South Wales, the northern boundary of the Ardennes, and of the neighboring Rhenish mountains contain the richest coal measures. And as we find west of the Allegheny region some coal measures, so we find some extensive coal layers north of the belt of the Hercynian Mountains in England and Scotland, in Upper Siberia, in the east of Germany, and in some places in the interior of Russia. The industrial evolution of the eastern United States, of England and Wales, of Belgium and the German Empire, is based on the same fact, that a rich vegetation once covered the foot-hill region of the mountains upturned towards the end of the Palæozoic era.

It is very interesting to see how the Appalachian region ends at Newfoundland, forming the projecting eastern corner of North America, and, just opposite, in south Ireland, in South Wales, in Cornwall and in Brittany the belt of the old Hercynian Mountains of Europe begins. One seems to be the continuation of the other, and such an excellent geologist as Marcel Bertrand maintained that we have here to deal with the two ends of one very extensive belt of mountains which extended through the North Atlantic Ocean. But we must not forget that the missing link between both ends of these supposed mountain chains is longer than their known extent.

There are also similarities of structure between the Mediterranean Sea and the Gulf of Mexico and its surroundings. Both seas consist of a set of very deep basins, separated by higher regions which reach more or less above the sea level, and the Mesozoic strata in their vicinity are folded, but there is one very marked geographical difference between their surroundings. On the north side of the Mediterranean Sea extends a nearly uninterrupted belt of mountains which contains the highest elevation of Europe, while there is no high mountain range at all at the north of the Gulf of Mexico. The high elevations on the north side of the Mediterranean sharply divide western Europe into an Atlantic and a Mediterranean part, while all the natural regions of eastern North America continue uninterrupted to the Gulf. The high mountain belt on the north side of the Mediterranean Sea prevents the rivers from entering the Mediter-

ranean; it pushes aside the Danube, and only the east annex of the Mediterranean—the Black Sea—receives in the Danube, the Dnieper, and the Don, important rivers which can be compared with the branches of the Mississippi River. But that river of Europe which as to size and ramifications bears most resemblance to the Mississippi—the Volga—empties its waters into the Caspian Lake. This, the largest lake on the earth, can be regarded, however, as an isolated basin of the Mediterranean. During the Ice Age, its waters stood probably so high that they could overflow through the Manych Valley, north of the Caucasus, into the Black Sea, so that the Volga had an outlet into the open sea. Therefore, during the Ice Age the arrangement of the eastern European rivers corresponded more nearly with that of the Mississippi and its branches, and this similarity would even exist if we assume that the Black Sea itself was then an inland sea, for such an inland sea could pour its waters through the Bosphorus into the Mediterranean. The Bosphorus, indeed, bears many features of a river valley, and it may have been at one time the outlet of all European rivers from the Danube to the Volga, of a body of water as large as that of the Mississippi. But while the large American river enters the sea through a large delta deposited by it, the European Mississippi passed through narrows just above its mouth, as the Hudson does; it had to force its way through the mountain belt north of the Mediterranean.

The absence of such a mountain belt in North America causes an important difference in the climate of the peninsular regions on both sides of the Atlantic. The climate of the Europe mainland is hardly at all affected by the Mediterranean, whereas the absence of a mountain belt north of the Gulf of Mexico allows the winds to sweep around the west end of the zone of high atmospheric pressure which extends across the Atlantic. Thus we have southwestern winds in North America; and as the southwestern winds of Europe bring the moisture and the warmth of the Gulf Stream drift over large areas of Europe, so also the moisture and warmth of the Gulf of Mexico is brought into the southeastern part of North America. The effect of the cooling influences which the interior of a continent can exert by its high pressure and cold on the mean latitudes of its east coast, is counteracted to a large extent; and peninsular North America, like the European peninsula of Eurasia, enjoys a peninsular climate, but not to such an extent.

But the peninsular climate of both sides of the Atlantic is not the same. It is most strongly developed in the south in peninsular North America, but in the north in Europe. The southwest winds blow in peninsular

North America mostly during the summer; in Europe, however, they blow during the winter, just at the time when cold northwest winds bring cold waves to the United States, and similar temperatures are met with in very different latitudes on both sides of the Atlantic. Indeed, the climate on both sides of an ocean can not be the same; there must be differences between the east and west shores of the continents. Europe has the true climate of the west coast of a continent. The climate of this side of the Atlantic has its exact counterpart in North America in British Columbia, and the Mediterranean climate recurs in all its characteristic features farther south in California. The high elevations of the mountains of British Columbia and of the Sierra Nevada, however, hinder the extension of these climatic conditions into the interior of the continent, while the open west of Europe allows the western winds to carry their moisture very far into the interior, and the long extent of the Mediterranean Sea is accompanied by a climate like that of California from the south of Spain over the south of Italy and Greece as far as Asia Minor. Thus one very large climatic province of very uniform character extends between the Atlantic Ocean and those semi-arid regions in which the higher civilization of the Orient in ancient times was born. And this climatic province possesses many features similar to those of semi-arid regions. This fact is one of the greatest importance for the evolution of civilization in Europe.

We can trace the European population very far back. Man witnessed in Europe that set of climatic changes which characterize the great Ice Age, but while it is still open to discussion whether the present population of Europe had its origin in that very old one or whether it came from Asia, there can be no doubt that the European civilization has its root in the Orient. Here in Mesopotamia and in Egypt an early civilization arose under arid and semi-arid conditions, based on irrigation; this civilization was brought by early navigators over the whole basin of the Mediterranean, and it found congenial conditions everywhere along the shores. In America such an evolution was impossible. An original civilization has, indeed, grown up here under semi-arid conditions, and it was also based on irrigation. This is not surprising. Irrigation is the easiest way to introduce agriculture. It is only necessary to distribute water, and crops become possible. The very difficult work of clearing the forest is not necessary. But a certain political organization is necessary, and this begins at the moment when rules are established according to which the water is distributed.

The conditions under which the early civilization on the plateau of

Mexico was developed are, indeed, in many respects similar to those of the Orient. That civilization, however, was not only far more feeble than that of the Orient, but it could not extend in the same way. The American Mediterranean is far larger than that between Europe and Africa, and early navigation did not find here the same landmarks which allowed the Phoenicians and Greeks to sail so far; but above all, the shores of that sea were not as inviting to settlers as are those of Greece, Italy, Spain, or northern Africa. They are covered over a wide extent by dense or nearly impenetrable tropical forests, and a belt of those virgin forests hindered the Mexicans from extending their civilization down to the Gulf of Mexico. At no time has this sea played a rôle similar to the Mediterranean; a Roman Empire could never grow up east of the cradle of the American civilization along the shores of the sea between North and South America.

The Roman Empire was a true Mediterranean state, but it pushed forward its frontiers as well to the deserts of the Orient as to the woodlands in the north. Woodlands only rarely favor the evolution of a primitive civilization. Agriculture needs here more than irrigation; the forests must be cleared. This is very hard work which goes on very slowly, and it must be followed by a continual struggle against the constant regrowth of the forests. Here family work is most successful, and political organization will only be formed very late. Indeed, the Romans regarded the wood-folk in the north as barbarians, though these had a civilization of their own which was of not inconsiderable height. They had already submitted extensive ground to agriculture; they already manufactured iron, and they were settled in villages and towns. But there can be no doubt that the Romans brought them more of the high civilization of the Orient than had reached them through the commerce of the Phoenicians and Greeks. By this means the Romans aided their neighbors in the north until finally the latter left their forests and conquered the south.

This political movement had as a starting point central Europe. This is the center around which the other parts of Europe are arranged in such a way that they can be directly reached, and while most of these other parts are more or less separated from one another, lying isolated like Great Britain, or stretching into neighboring seas like Scandinavia, or Spain, or Italy, or the Balkan Peninsula, they all are either connected with or are near to central Europe. Therefore, the relations between those members of Europe and the center were always active. Open on all sides, this center suffered from its neighbors when its population was feeble and with-

out force; or on the other hand when its inhabitants were strong, they influenced all Europe. More than once central Europe acted as the heart of the European body and drove fresh blood into the members.

When the forest-folk of central Europe had gained from the Romans knowledge of the favored regions of the Mediterranean basin, rich in all kinds of fruit, they began to move toward the south; they laid in ruins the Roman Empire and founded new kingdoms, but they could keep their nationality only where they appeared in great numbers. They were absorbed by the peoples of southern Europe, and the German ground extended only in the southwest, along the Rhine, and in England. England still bears the name of the German tribe—the Angles—who, together with the Saxons, conquered that extreme part of the old Roman Empire, and in the whole of Europe we find witnesses of former German immigration. In the south of Spain, the name of Andalusia reminds us of the German tribe of the Vandalians who came from the Baltic Sea. In upper Italy, Lombardy conserves the name of those long-bearded Germans who settled there, and in the regions north of Milan you see more blonde people with blue eyes than in many parts of the German Empire. France received her name from the German Franks who extended their empire there.

The emigration of the German wood-folk seems not to have been caused by the pressure of other peoples. There seems to have been awakened among the German tribes a yearning to occupy better countries than their own. It seems to have been a longing to migrate, and to settle new countries similar to that which prevailed in the eastern states of North America for more than one hundred years, and which caused that enormous extension of the Anglo-Saxon race over the whole continent of North America. As in New England, the woodlands which were left by the agricultural population were settled by new emigrants—the old Puritan ground being entered by Roman Catholic Irish and Italians and French Canadians and Russian Jews—so also in Germany the areas which had been left by their emigrating inhabitants were re-settled, especially the eastern part. But the emigration had been more complete than in eastern New England, and the new settlers found a vacant country in which they could introduce their own language. A reaction, however, set in, and since the times of Charlemagne the Germans have been taking back their old land from a population whose descendants are to-day, in North America, classed as undesirable immigrants.

While this was beginning, the northern neighbors of the Germans, the Scandinavians, were seized with the same longing to migrate that the

Germans had experienced several hundred years ago, but while the Germans migrated on the land, the Scandinavians went on the sea. Scandinavian tribes crossed the Baltic Sea and founded in the forests of northern Russia the Russian Empire, the name of which points back to the times when the Scandinavian conquerors used their slave subjects as "rowsmen." Scandinavian pirates devastated the coast of northern Germany, of England, Scotland and France, where they settled, forming Normandy. They sailed into the Mediterranean Sea, and at Constantinople met with their countrymen coming through Russia. Others went into the northern seas, discovering the Faeroe Islands, Iceland and Greenland. They even came over to North America, but this discovery was not accompanied by a large number of men prepared to settle, and it remained unknown to the greater part of Europe. Even Greenland was totally forgotten, and its few Scandinavian inhabitants expired when they came into contact with the Eskimo population. Thus the outburst of Scandinavian peoples, like the older outburst of German peoples, resulted in but a slight expansion of Scandinavian ground. The Norman settlers along the Mediterranean and the shores of the Channel became intermixed with their neighbors, and when the Normans conquered England they brought with them French language and French customs.

In Germany, after the time of martial expansion of the people was over, more settled conditions ensued, and the vast forest-clad mountain regions, which had heretofore been only visited by hunters, were now cleared and a kind of interior colonization took place in the central part of the empire. The terminations "reute" and "schwende" of names of German villages indicate that the clearing of their forests was either by felling or burning the trees, and the Germans became so famous as clearers of woodland that they were called into the mountains of Bohemia, Silesia and Hungary, where peaceful colonization took place. German colonies, following the extension of German sea traffic, were founded along the shores of the Baltic Sea, and even on the west coast of Norway, where the city of Bergen is a German colony: even centuries after, when the Russian Empire had been extended from the Baltic to the Black Sea and to the Pacific, Germans were invited to settle in order to cultivate the country. These German colonies, which spread over all Russia, are found even in the steppe countries east of the Volga and of the Crimea.

Those waves of Asiatic steppe rough riders which now and then spread out over the low ground of eastern Europe, were always broken when they reached German ground. Here the Hungarians were defeated. The

Mongolian wave which had terminated the early Russian Empire when it came to eastern Germany met with the same fate, as did the wave of Turks which so easily rushed over Hungary. From the walls of Vienna imperial German armies drove back the Turks into those frontiers of Turkey which lasted until the end of the nineteenth century, and German settlers founded a new culture in Hungary.

Thus the influence of early German conquest and later German peaceful colonization is felt nearly over the whole of Europe. The earlier conquest formed the nobility of France and Italy, where many noble families still conserve more or less corrupt German family names, and German names were long in use for noblemen in mediæval times. German colonists developed the agricultural resources of the southeast and east of Europe, and German merchants extended their commerce on the coast of the whole Atlantic Europe.

This kind of peaceful German extension is also favored by the central position of Germany in Europe, but it is very much based on the fact that Germany herself is not a country too much favored by nature, and it is her very poor soil which has educated her population to strong and intelligent labor. This population, however, increased to greater numbers than the ground could support, and this is the real cause of the expansion of German population by immigration, the influence of which has-been so markedly felt by all Europe. It is the natural expansion of a strong, working forest-folk, and one which resembles very much the expansion of the people on the east coast of North America over a whole continent.

The virgin forests of peninsular North America were far out of the reach of original American civilization, which could neither spread out over the shores of the American Mediterranean nor cross the arid regions and deserts north of Mexico. Their Indian inhabitants remained in the state of hunters and never cleared the woodland. The natural riches of that region were developed only when it was settled by Europeans, who had learned in Europe to overcome the resistance of forests to agriculture. And soon after its colonization, its population experienced that strong wish to expand which is so characteristic of early German migrations. The descendants of that population on the Atlantic slope of North America who had cleared the virgin forests, crossed the Appalachian chain, cultivated the prairie grounds of the Mississippi basin, and adapted themselves to the arid climate of the west and the Italian climate of California. Thus the Atlantic side of North America plays in its colonization a rôle similar to that of Germany in the history of Europe.

The expansion of eastern North America, however, met with no strong resistance from the other inhabitants of North America. The Indians defended their ground in insufficient numbers and with insufficient arms, and they died out when they came into contact with a higher civilization. In Europe, on the other hand, German emigrants spread amid peoples of larger numbers, and became, therefore, partly absorbed. The difference in expansion between the Atlantic North American and the German populations is neither caused by a greater strength of the North American expansion, nor by a lower education of German settlers; it is due to the fact that the North American expansion extended over a continent inhabited only by nomadic tribes of small numbers and of low civilization, while the German expansion extended over vast areas occupied by peoples with a culture and an organization of their own. This again is due to the fact that a higher civilization had spread out all over Europe, while the native civilization of North America remained restricted to the plateaus west of the Gulf of Mexico.

There is a remarkable resemblance between the expansion of the German population and that of America, and if we follow the latter to its sources we find that the early English settlers on the east coast are the descendants of the German conquerors of England, and their extension towards the west was followed and reinforced by a powerful wave of peaceful German immigrants, differing in language but similar in kind, and both waves formed one population in which the old German spirit of expansion is very active.

It is a curious chance that America received its name from a German geographer. Old Professor Waldseemueller made a mistake, indeed, when he named the new countries at Brazil after the Florentine Amerigo Vespucci. It would have been far more just to have named the new world after Columbus, but though Waldseemueller recognized his mistake and withdrew the name, it remained in use. And curiously enough, that Amerigo Vespucci, whose name gave origin to the name of America, had himself, though an Italian, still a German name, Emmerich, Emery in English. Thus America is a continent with a German name, the meaning of which might, perhaps, be interpreted as "rich in corn;"[1] if this is correct, Professor Waldseemueller chose an incorrect but appropriate name.

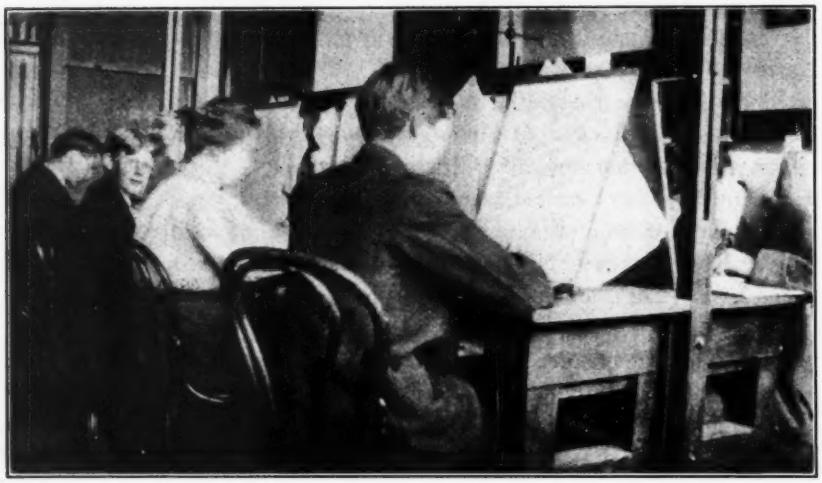
—From *The Scottish Geographical Magazine,* July, 1909.

[1] *Amar*, old German, a kind of wheat.

A PHYSIOGRAPHY LABORATORY

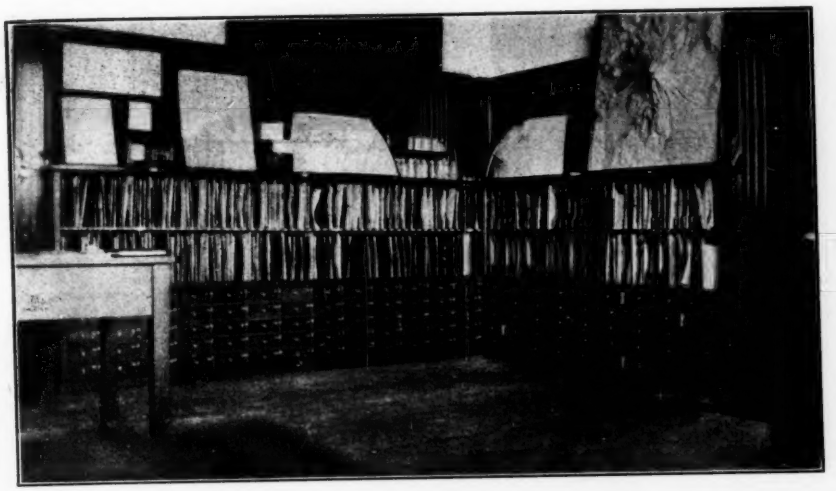
By JANE STEARNS
Washington High School, Portland, Orgeon

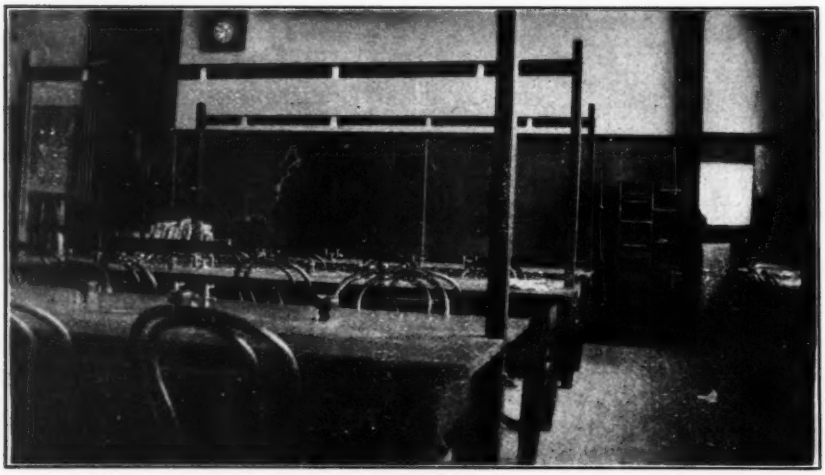
IN the Washington High School of Portland, Oregon, there is an interesting laboratory. Three long laboratory tables are surrounded by revolving chairs, accommodating twenty-four pupils in all. In the middle of each table is a tank, about eight inches wide and eight inches deep, covered by a board that fits down flush with the table. When the tank is in use for running water or waste, the lid is removed and placed to one side. When not in use, the lid is replaced. The water enters the tank at one end, through a pipe that prevents spatter, and is drained away

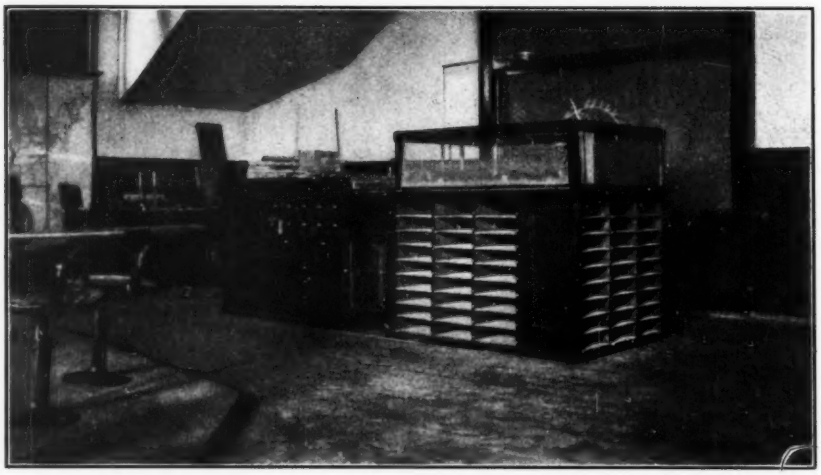


at the same end, into a box that collects sediment. Above each table is a two by four bar, supported by two by four joists, so arranged, that the bar may be raised or lowered. Weather maps may be hung to the bar, when it is raised, and it is lowered to accommodate map boards. The map boards, when not in use, are slid under the table like a bread board. In the frame of the table, just to one side of the slit for this board, is a hole for a locker box, when in use.

The locker boxes are numbered and, when not in use, are kept in a case, in one corner of the room. Each has a combination lock and is supplied with pencils, pen, eraser, compass quadrant instrument, and file.

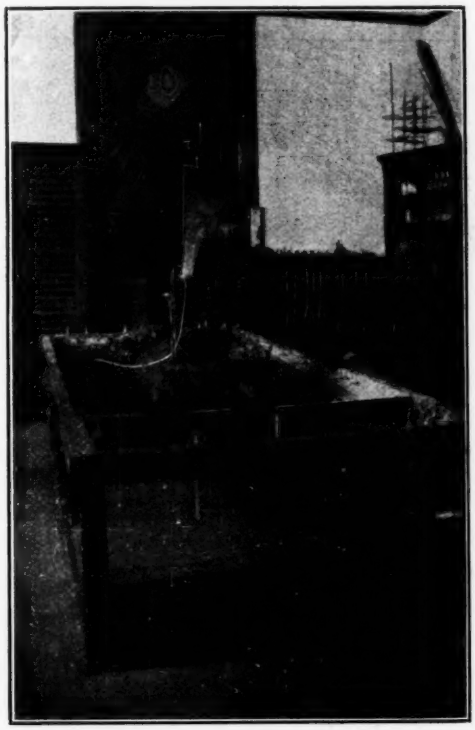






Above the locker case are two shelves which are partitioned off into small pigeonholes, just large enough for note-books. Above the pigeonholes are Howell's models of the United States and Shasta. Other models are placed on this shelf when they are needed. These cases and models are at a height that makes them very accessible to the pupils.

Near the entrance is a table, where text-books, for other recitations, are kept. This prevents them from interfering with laboratory work. A calendar hangs in a conspicuous place on the wall. Near the door is a



barograph, and beside it, the weather map is placed each day. On the left side of the entrance is a barometer in a glass case. The rest of the instruments for determining weather are kept in a shelter on the roof. These are examined and the records kept on the wall above the weather map.

In a large glass-covered map case, on one side of the room, maps that show the topographical features are kept. Large drawers under this case accommodate ocean charts, and a large tray in the back will hold the

largest maps published. The end is so arranged, that it will accommodate relief models.

Next to this map case a door opens into a small dark room, that is used by the camera club in developing pictures.

On one side of the room is a table about two feet wide, running the full length of the room. This furnishes a suitable place for rocks and minerals when they are in use.

There are two blackboards in the room. On one a map of the United States is painted. There is plenty of room for other work on this board.

The other blackboard is next to the apparatus case, and is a triple board. There are three boards that slide up and down like a window. When one is filled it can be raised and the next one used. The bottom board has cross section lines painted on it, so that curves may be represented in chalk and erased and the cross section lines remain to be used repeatedly.

Maps can be tacked to burlap that covers two corners of the room. The cloud pictures are placed near the window, for comparison and naming clouds. In Portland the clouds and rain are very accommodating and laboratory periods are frequently devoted to a study from the window or roof.

In the middle of the room is a large delta table, about fifteen feet long, six feet wide, and three feet high. This table is divided into two parts by a partition, which has a lock eight inches wide in the middle. The lower and smaller end has glass sides and represents the deep sea. The portion

immediately above the lock represents the epicontinental sea; while the highest part represents the highlands. On this table is soil. Rivers and deltas are made by using a shower to represent rain. An artesian well, a contour island and many other features of topography are modeled so that the principles may be clearly understood. Under the table are modeling boards that are used by the pupils to illustrate with clay some special part of the work. The delta table may be covered with boards and used as an ordinary table, if desired.

Back of the delta table is a large apparatus case, with glass doors, where globes, glassware, scales and other pieces of apparatus are kept.

Field trips are not omitted and the pupils are free to work after or before school if they are slow, backward, or wish to do very careful and thorough work.

Adjoining the Physiography Laboratory is the lecture or recitation room. In this room a platform is constructed to slope diagonally upward, to one corner of the room. Rotary tablet armchairs are attached by their pedestal base in a diagonal position, so that a good view may be obtained from any seat in the room. A Jenkin's map rack is attached to a movable base. The rack holds all the physical wall maps and many others that are needed for class work. In the illustration the rack conceals a large book and specimen case. A movable picture frame is ready for demonstration work, and a folio case is within convenient distance of the teacher's desk. The mineral case is divided into three parts. The lower part is filled with 8-inch drawers, for large rocks. Above these, and behind glass doors are movable trays of minerals, each tray holding 24 specimens. On top of this case are narrow, movable, specimen boxes. The Howell's keys and scales are kept in these boxes, and are removed to the laboratory when needed. In another part of the room is a demonstration table. Bins of plaster, clay and sand swing easily from under this table. The drawers are made to accommodate lantern slides, weather maps, and apparatus. A movable blackboard is easily seen, when up. The lecture curtain drops diagonally from the ceiling. The lantern is in a corner behind the seats always ready for use.

At present there is no museum, and an instructor's office room is badly needed; when these improvements are made, and the compressed air machine installed, with proper care, the laboratory can be run for a great many years, with practically no expense.

NOTES

MOUNTING PAPER MAPS ON MUSLIN.—The different bureaus of the Government are issuing annually a large number of maps that might be used more generally in our schools. Nearly all of these maps, however, are printed on paper. No kind of paper when much handled is very enduring. All such maps, then, should be mounted on muslin if we wish to get the best service out of them. In this article I will describe briefly a method of mounting paper maps.

The muslin should be stretched on a flat surface; I use a table made purposely for the work. It has a pine top, 6½ x 10½ feet, and 1¾ inches thick. The boards are sawed with a special locking joint and glued together. The top is not fastened directly to the base but is held by bent iron plates attached to the under surface of the top and fitted into grooves in the base; this allows the top to shrink and expand with atmospheric changes without checking and warping as would be the case if it were screwed or nailed directly. While such a map-mounting table is very satisfactory, part of the expense which it represents adds only to convenience in the work. Very good results may be had in using even a kitchen table in case you do not wish to make assembled maps larger than this form of table. I frequently combine numerous separate sheets into one large one, and for this work a commodious table is sometimes necessary. Even a table of the above dimensions can be made for less money, and at the same time answer most purposes; the top may be built up of thinner boards laid cross-wise so as to prevent warping, and putty used if cracks develop. Such a top need not be fastened at all to the base, but simply set upon it. Soft wood should be used. Otherwise it will be difficult to fasten the muslin with the thumb tacks.

In nearly all maps there is some margin of plain paper which may be dispensed with when mounting; for this reason, I trim the maps as closely as possible. The size is thus reduced for housing, at the same time saving muslin. For trimming the sheets I have a zinc-covered platform 21 x 28 inches; this is made of two courses of board to insure a level surface. It may be placed on a table when in use. A shoemaker's knife drawn along the edge of a square gives the best results; it is absolutely necessary in making assembled maps that the trimming be clean-cut. A piece of plate glass large enough to hold a carpenter's square is even more satisfactory than the zinc-covered platform.

The maps should be moistened thoroughly before mounting; this is best done by placing them face down to a flat surface, and spreading the water with a brush, a cloth, or the hand; several maps may be moistened at once. It will be necessary to lift the map occasionally to keep it free of wrinkles, as the map gets larger in taking up the moisture. Some maps will require more time for this part of the process than others; this is due to a variation in weight of the paper on which the maps are printed.

Before applying the paste, all surplus water should be wiped off with a cloth or sponge; this is necessary in order not to dilute the paste. I use what is generally known as bookbinders' paste. The following formula will mount about one hundred topographic sheets: mix three-fourths pound of flour with one pint of cold water; stir this slowly into two and one-half quarts of boiling water, and add one teaspoonful of powdered alum. This should be strained through a coarse cloth, and allowed to cool before using. It is very necessary that the paste be spread uniformly over the whole surface of the map, and care should be taken particularly near the edges; I use a two-inch, fine-bristle brush for this purpose. In placing the map on the muslin always avoid lifting by the very edge; reach back a little from the edge; the film of paste is partly removed wherever the fingers touch. Care should be taken to spread the maps smoothly on the muslin; this is generally best accomplished by spreading out from the center toward the ends.

In making combined maps of adjacent topographic sheets, it is advisable to first arrange them in the proper positions and then to proceed with the trimming. Commencing with the sheet at any corner, the bordering side and end should be trimmed, leaving a margin about one-fourth inch wide; the next adjacent sheet to the right or left should be cut along the meridian line; a margin should be left on its opposite side and on one end; when ends are to be matched, one will be trimmed along the parallel. In this way the highways and contour lines can generally be made to match. If in a set of sheets that you wish to combine into a single map the paper should vary much in weight, it will be necessary to allow the thicker sheets more time for taking up the moisture. If when you come to paste these to the muslin it appears that a particular sheet does not match readily, by a little manipulation you will be able to stretch it; or, if necessary, it may be laid down without any stretching, and even allowed to shrink some. In spite of all care, however, some instances arise in combining maps when it is found impossible to make the highways and contours always continuous.

The topographic maps of the United States Geological Survey are used

more extensively than any other Government maps; but the sheets accompanying Water Supply Bulletins, as well as those issued by other branches of the Survey, may be used to advantage in our teaching; the maps issued by the Bureau of Soils of the Department of Agriculture are also of much value.

The combined maps may be rolled on a piece of moulding for storing. Any map cabinet, or other fairly dust-free inclosure, will answer for storage purposes. If many combined maps are to be used in a school, much time can be saved, and the life of the maps lengthened, by keeping them in a specially constructed cabinet. For housing single sheets any method that keeps them free of dust and convenient to get at is satisfactory.* If a school should accumulate many hundred topographic sheets, the question of storage becomes one of much concern, because a teacher should have them so conveniently arranged that the minimum amount of time is required for putting his hand on any particular map.

The use of topographic sheets is largely limited to high school classes in physical geography. In some schools, not many, however, they have been profitably placed in the hands of grammar and grade pupils. Personally, I feel that a child who is mature enough to get anything out of a map in his geography text-book will be profited by a topographic map. Home geography especially may be advantageously approached through the local sheet; the child is easily interested in a map that gives details with which he is familiar.—By Frank Carney in *School Science and Mathematics,* November, 1909.

Papua and Its Economic Resources.—From a recent issue of the *Bulletin* of the Imperial Institute, we extract the following account of Papua or British New Guinea.

The total area of Papua, 90,540 square miles, is made up of 87,786 square miles mainland of the island, and 2,754 square miles in adjacent islets numbering about 200. The size of the country can be most readily gauged by comparison. Papua just exceeds Great Britain in area, and is the largest British insular possession in the tropics, and far larger than all the British West India islands put together (12,079 square miles).

Papua has a characteristically tropical climate. Broadly regarded, the year is divided into two seasons, viz., that of the southeast trades, extending from May to November, and that of the northwest monsoon, from Decem-

* In the *Journal of Geography*, Vol. VII, pp. 52-54, 1908, I have described and illustrated Cabinets for both rolled maps and single sheets.

ber to April. On the coast, the force of the southeast wind when at its height is considerable, but inland it is light. The northwest monsoon, unlike the southeast trades, does not blow steadily, but comes in sudden squalls, often accompanied with rain. The southeast is the drier of the two seasons; in some districts, notably that of the central strip of coastline near Port Moresby, between Hall Sound and Hood's Peninsula, it is conspicuously so. At Samarai, near the eastern end of the territory, and at Daru, near the western end, the rainfall is fairly evenly distributed throughout the year, and the same applies to most of the country except the central strip of coastline. During the year 1906, at Port Moresby the mean monthly temperature ranged from 72.°9 in July to 83.°4 in February, and the total rainfall for the year was only 35.711 inches. At Samarai the mean monthly temperature ranged from 75.°5 in August to 82.°6 in February, and the total rainfall for the year was 92.145 inches. At Daru the mean monthly temperature ranged from 75.°6 in August to 82.°9 in February, and the total rainfall for the year was 137-180 inches.

The western part of Papua is for 300 miles along the coast generally low and swampy, mangroves and sago-palm being prominent features of these swamps. Inland there is limestone country. The Fly River, the largest of all the rivers, rises in German New Guinea, and after passing through the eastern part of Dutch New Guinea, enters the western part of Papua, and has from the German boundary to its mouth on the Gulf of Papua a length of 620 miles; this river is navigable by steam launch for 500 miles, and tidal for 200 miles. The Purari, the second river in size, also rises in Kaiser Wilhelm's Land, and after entering Papua flows through a sandstone country, and ultimately debouches into the Gulf of Papua, being navigable by steam launch for 120 miles. Towards the east the country becomes more mountainous, sandstone and other sedimentary formations predominating, but there are igneous outcrops such as Mount Yule, upwards of 10,000 feet in height. The central chain of mountains is schistose, and attains its greatest altitudes in the Owen Stanley Range, the highest points of which are Mount Victoria (13,200 feet), Mount Scratchley, the Wharton Range, and Mount Albert Edward, the latter approximately the same height as Mount Victoria. Igneous mountains continue the chain to the eastern end of the island. Several islets off the eastern capes are volcanic.

There are many excellent harbors, which will prove of great value in developing the industries of the country, and four are ports of entry. The westermost port of entry is Daru, a small island off the mouth of the Fly

River. Proceeding eastward across the Gulf of Papua, the next port of entry is Port Moresby, distant 270 miles from Daru. The third is Samarai, and the fourth Bonagai in Woodlark Island.

The value of the exports for the year ended June 30, 1906, were: gold, £58,496; copra, £9,315; bêche-de-mer, £3,027; sandal-wood, £2,522; pearls, £2,478; rubber, £1,145; coffee, £915; turtle-shell, £568; pearl-shell, £267; green snail-shell, £234. The total exports were valued at £80,290. To this must be added about 7,250 ounces of gold, valued at £27,000, which the owners took with them and sold, principally in Queensland, when on a visit to Australia, and of which there is no customs record.

—From *Scottish Geographical Magazine,* October, 1909.

GEOGRAPHY IN SECONDARY SCHOOLS.—Physical geography should come in the first year of the high school, because here it becomes a fitting culmination and systematization of the bits of descriptive physical geography that have gone before. Here, it also forms a basis for other work in the three years to follow. Most subjects pursued in the secondary schools are, because of their nature, related to and built upon physical geography. Physical geography is fundamental both for all other geography and also for zoölogy, botany, history, civics, and economics. Thorough text work should be done, covering the subjects usually treated in any of the five or six better books; a very little collateral reading can be done, especially where it is possible to utilize books on the physiography of the state, such as a number of our state geologic surveys are now preparing. The subject matter of the course must be largely descriptive, but the development idea should not be lost sight of. The systematization and classification of land and water forms should follow the descriptive part, but should not be carried too far, remembering that pupils can not classify until they have something to classify and know its characteristics. Use a classification based on origin and stage in development—a real genetic classification. Systematic physiography can wait for full development in college.

The classroom should be supplemented with pictures, lantern slides, maps and globes, and upon these should be conducted systematic laboratory work, aimed at results, and not at entertainment. Keep the laboratory work where it develops reasoning or skill and not merely memory. The laboratory work should be carried into the field for the identification of the real things. Some excursion work in both fall and spring, and conscientious laboratory work all the rest of the year, would give the pupil a

knowledge of realities upon which to base his conceptions of forms and processes which can not be seen. The wise teacher will remember that physical geography is not physics, geology, petrography or chemistry. Nor has it any business collecting specimens. Pictures may be taken, and maps and sketches made with profit.

Passing over, for the present, commercial geography which, except in the commercial course, should be elective, and meteorology, which should be elective in all courses, we come to the regional geography. "Its educational value lies in its being a synthesis which in its simpler elements is obvious to the very young, and in its more complex ones presents problems difficult enough to attract the keenest intellects, while its results have a direct bearing on national as well as on individual life. No other subject unless it be sociology, gives the comprehensive outlook on existing conditions which must be taken into account in all the larger problems of life."[1]

The physiographic region should be the unit in this course; first the larger regions of the continents, then the lesser subdivisions. It is too late in the history of geography to make the political domain the unit of study. I have suggested elsewhere[2] that the actual region studied "might be one whole country, as Italy, or two, as Spain and Portugal, or only a part of one, as the Appalachian region in the United States. Descriptions of the physical features and the climate and resources should be coupled with explanations of these phenomena, followed by descriptions of the culture features, boundaries, towns, communications, industries and human distributions always causally connected with the physical features." Geography, with its half-dozen branches, is a unit, and all should be carefully knit together. But geography is not history, economics or sociology.

Longman's School Atlas (mainly physical), the atlas volume of the last census of the United States, and similar atlases from the censuses of other countries, Bartholomew's Atlas of Meteorology, forest and crop maps, maps of mineral productions, and the political maps somewhat familiar from the grade studies, furnish basal material for the laboratory work. Put side by side a rainfall and a forest map of the United States and attempt the interpretation of the distribution of forests. Then put maps of the distribution of the lumber industry, the great lumber markets, and the wood manufacturing centers over against the forest map; watch the interest grow. Place rainfall, temperature and wheat maps together, rainfall and wool production maps, temperature, rainfall and cotton pro-

[1] Herbertson, A. J., *Geog. Jour.*, 1904, p. 426.
[2] *Educational Review*, 1908, p. 396.

duction maps together. Study iron producing, iron manufacturing, population and transportation maps together. Study topographic and population maps together. Work out relations between topographic and railroad maps. See how many ways one can go from the Atlantic seaboard to the Mississippi Valley by rail, then in how many places one can cross the Ohio-Indiana or Indiana-Illinois line, and from the topographic map see why. How many routes from Mississippi Valley to Pacific Coast? How do the railroads enter Cincinnati or Pittsburg, and how do they enter Chicago, Columbus, or Cleveland? Then consult the local United States Geologic Survey topographic sheets to see why the differences. Compare the physical map of England or of Europe with a map showing distribution of peoples; then with these two and temperature and rainfall maps see how many peculiarities in the distribution of the people can be explained. Wind, temperature and rainfall maps for January and for July will reveal to the inquiring student the main features of the two rainy and two dry seasons of certain parts of the tropics. The monthly rainfall maps of the Upper Nile Valley will reveal the secrets of the Nile flood. Leete's Map Exercises in Geography are very helpful along this line of geographic study.

For text-books, probably the best all-around book for the high school course is Mill's International Geography, published by Appleton. It must be accompanied, however, with atlases and maps, and for best results certain parts in the treatment of several of the countries should be omitted. Appleton's Series of Regional Geographies in twelve volumes, one for each of the larger regions, like North America, Central Europe, Britain and the British Seas, India, the Nearer East, and others, makes a splendid series to accompany the course. Stanford's Compendium, new edition, is good for reference work. Brigham and Semple have two admirable books on the geographic conditions affecting American history, which might be helpful.

A specific study of the United States for one year, and of Europe for a second year, or a general study of a number of world problems, for a year, would be immensely interesting and of inestimable value to the pupil. Let me urge that he who would introduce regional geography into the secondary school must reckon on a laboratory (map room), and a laboratory period in his program; and he may also count on being, to some extent, a missionary in most communities. But in spite of indifference, inertia, open opposition, the critics, crowded program and all, I believe it will pay to put into some of our high schools a year in regional geography as a trial. —From article by Geo. D. Hubbard in *Ohio Educational Monthly*, September, 1909.